

---

## Automated Video-Based Analysis of Contractility and Calcium Flux in Human-Induced Pluripotent Stem-Derived Cardiomyocytes Cultured over Different Spatial Scales.

**Journal:** Tissue Eng Part C Methods

**Publication Year:** 2014

**Authors:** Nathaniel Huebsch, Peter Loskill, Mohammad A Mandegar, Natalie C Marks, Alice S Sheehan, Zhen Ma, Anurag Mathur, Trieu N Nguyen, Jennie C Yoo, Luke M Judge, C Ian Spencer, Anand C Chukka, Caitlin R Russell, Po-Lin So, Bruce R Conklin, Kevin E Healy

**PubMed link:** 25333967

**Funding Grants:** Interdisciplinary Training in Stem Cell Biology, Engineering and Medicine

### Public Summary:

Contractile motion is the simplest metric of cardiomyocyte health in vitro, but unbiased quantification is challenging. We describe a rapid automated method, requiring only standard video microscopy, to analyze the contractility of human-induced pluripotent stem cell-derived cardiomyocytes (iPS-CM). New algorithms for generating and filtering motion vectors combined with a newly developed isogenic iPSC line harboring genetically encoded calcium indicator, GCaMP6f, allow simultaneous user-independent measurement and analysis of the coupling between calcium flux and contractility. The relative performance of these algorithms, in terms of improving signal to noise, was tested. Applying these algorithms allowed analysis of contractility in iPS-CM cultured over multiple spatial scales from single cells to three-dimensional constructs. This open source software was validated with analysis of isoproterenol response in these cells, and can be applied in future studies comparing the drug responsiveness of iPS-CM cultured in different microenvironments in the context of tissue engineering.

### Scientific Abstract:

Contractile motion is the simplest metric of cardiomyocyte health in vitro, but unbiased quantification is challenging. We describe a rapid automated method, requiring only standard video microscopy, to analyze the contractility of human-induced pluripotent stem cell-derived cardiomyocytes (iPS-CM). New algorithms for generating and filtering motion vectors combined with a newly developed isogenic iPSC line harboring genetically encoded calcium indicator, GCaMP6f, allow simultaneous user-independent measurement and analysis of the coupling between calcium flux and contractility. The relative performance of these algorithms, in terms of improving signal to noise, was tested. Applying these algorithms allowed analysis of contractility in iPS-CM cultured over multiple spatial scales from single cells to three-dimensional constructs. This open source software was validated with analysis of isoproterenol response in these cells, and can be applied in future studies comparing the drug responsiveness of iPS-CM cultured in different microenvironments in the context of tissue engineering.

---

**Source URL:** <https://www.cirm.ca.gov/about-cirm/publications/automated-video-based-analysis-contractility-and-calcium-flux-human-induced>